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EXAMINER

CREPEAU, JONATHAN

ART UNIT	PAPER NUMBER
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1746

DATE MAILED: 04/04/2003

6

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

09/858,327

Applicant(s)

OHLSEN ET AL.

Examiner

Jonathan S. Crepeau

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 May 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6, 8-13 and 15-40 is/are rejected.
- 7) ☒ Claim(s) 7 and 14 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4.
- ☐ Interview Summary (PTO-413) Paper No(s). _____.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other:

DETAILED ACTION

Claim Objections

- / 1. Claims 15 and 16 are objected to because of the following informalities: in claim 15, line 13 and claim 16, line 17, the limitation “the one or more cathodic fluid removal channels” lacks antecedent basis. Substitution of --anodic-- for “cathodic” is suggested.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

- / 3. Claim 40 is rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for a polymeric *electrolyte* coated on pore surfaces, does not reasonably provide enablement for a polymeric *catalyst* coated on pore surfaces. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with claim 40. On page 34, line 10, the instant specification states that “an aspect of the present invention relates to the use of polymeric electrolytes on the pore surfaces of each electrode structure.” The specification further states that this material is NAFION®, which is known to function as an ion conductor but not a catalyst. As such, for examination purposes herein, claim 40 will be interpreted as requiring a polymeric electrolyte uniformly deposited on the inner pore surfaces.¹

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 17, 18, 23-25, 27-32, and 34-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over FR 2667728 in view of DE 198 20 756 and in view of Wilkinson et al (U.S. Patent 5,874,182).

Regarding claims 17 and 40, the French reference is generally directed to a fuel cell system comprising an electrode assembly (see abstract; Figure 1). The assembly comprises an anode, cathode and electrolyte (3, 9). The central portion of the electrolyte (3) functions as a spacing structure. Regarding claims 27, 28, 34, 35, and 40, each electrode comprises a plurality of pores (7) having catalyst particles (8) noncontiguously dispersed thereon (see Fig. 1). Regarding claims 29 and 36, the anode and cathode catalysts are derived from a metal, particularly platinum (see page 5, first full paragraph of translation). Regarding claims 17, 37, 39, and 40, the central portion of the electrolyte (3) contains a liquid such as phosphoric or sulfuric acid (see page 4, second-to-last paragraph of the translation). Regarding claim 40, a polymeric electrolyte (9) is uniformly deposited on the inner pore surfaces (see page 5, first full paragraph).

The French reference does not expressly teach that the electrodes are derived from planar silicon substrates (claims 17 and 18), or that the electrodes each have a plurality of discrete

porous regions (claims 24, 25, 31, and 32). The reference also does not teach a plurality of integral flow channels in each electrode (claims 23 and 30), or that an aqueous organic fuel (e.g., methanol) flows through the anode and central portion of the electrolyte (claims 37 and 38). The reference further does not teach that the anode catalyst particles are derived from platinum and ruthenium precursors (claim 29) or that both catalysts are chemisorbed (claims 28, 29, 35, and 36).

The DE '756 publication is directed to perforated silicon workpieces that may be used as electrodes (i.e., catalyst supports) in fuel cells (see abstract). The workpiece comprises pores (channels) that are formed by etching. The workpiece also has a plurality of discrete regions (6) containing the pores (4) (see Figs. 4 and 5). Regarding claims 25 and 32, the pores have a diameter of 2 microns, thereby rendering the workpiece macroporous (based on an oral translation of col. 3, line 21).

The patent of Wilkinson et al. is directed to a method and apparatus for reducing reactant crossover in a fuel cell (see abstract). In column 8, line 21, the reference teaches that methanol may be supplied to the anode in an aqueous acid solution. In column 8, line 38, the reference discloses an anode catalyst composition of carbon-supported platinum and ruthenium.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the perforated silicon workpiece of the German reference as the anode and cathode catalyst supporting structures of the French reference. In the abstract, the German reference teaches that "the incompletely perforated second regions provide the perforated workpiece with increased

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strength and stability in an inexpensive manner, so that the risk of breakage during mounting is reduced.” Accordingly, the artisan would be motivated by this disclosure to use the workpiece of the German reference as the catalyst supporting structure in the electrodes of the French reference.

Additionally, the disclosure of Wilkinson et al. would motivate the artisan to feed an aqueous methanol/acid solution to the anode, and thereby to the electrolyte, of the French reference. In column 2, line 15, Wilkinson et al. teach that such an aqueous solution “is the preferred feed” to the anode. Accordingly, the artisan would be motivated to feed an aqueous methanol/acid solution to the anode, and thus to the electrolyte, of the French reference.

Regarding the catalyst composition recited in claim 29, Wilkinson et al. teach in column 8, line 26 that “any catalyst which is effective for the oxidation of methanol may be employed in the anode of a direct methanol fuel cell.” Since Example 1 of Wilkinson et al. employs a Pt-Ru catalyst, the artisan would be reasonably apprised of the suitability of this composition for use as the catalyst of the French reference. Accordingly, this limitation is not considered to distinguish over the references.

Regarding the limitations in claims 28, 29, 35, and 36 that the catalysts are chemisorbed onto the pore surfaces, these limitations do not have to be accorded patentable weight because they do not limit the structure of the electrode. Generally, process limitations in product or apparatus claims are not accorded weight because they do not structurally limit the product or apparatus (MPEP §2113).

6. Claims 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over FR 2667728 in view of DE 198 20 756 in view of Wilkinson et al. as applied to claims 17, 18, 23-25, 27-32, and 34-40 above, and further in view of WO 98/21777.

The French reference does not expressly teach the presence of a blocking media that is substantially impermeable to methanol but substantially permeable to hydrogen atoms interposed between the anode and cathode (claim 19). The reference further does not teach that the blocking media is integrally connected to the cathode (claim 20), that it comprises a metallic membrane (claim 21), or that it comprises Pd, Nb, Ta, or V (claim 22).

WO 98/21777 is directed to a fuel cell comprising a methanol blocking media (5) interposed between an anode (3) and a cathode (7) (see abstract; Fig. 1). The blocking media is integrally connected to the cathode via the electrolyte (6), and comprises a metallic membrane such as a palladium alloy.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the disclosure of the WO '777 reference would motivate the artisan to include such a blocking layer in the fuel cell of the French reference. In the abstract, the WO '777 reference teaches that the blocking layer is suitable in fuel cells using methanol as a fuel. Accordingly, the artisan would be motivated to include such a blocking layer in the fuel cell of the French reference, since as noted above, the artisan would also be motivated to use methanol as the fuel of the French reference.

7. Claims 1-6, 8-13, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over FR 2667728 in view of DE 198 20 756 in view of Wilkinson et al. as applied to claims 17, 18, 23-25, 27-32 and 34-40 above, and further in view of Mercuri et al (U.S. Patent 6,413,671).

Regarding claims 1, 8, and 15, DE '756 further teaches in Figures 4 and 5 that one side of the silicon substrate comprises channels (6) which connect a plurality of acicular pores (4). However, DE '756 does not expressly teach that the other side of the substrate comprises channels such that the pores are in fluid communication with channels on both sides of the substrate, as recited in claims 1, 8, and 15.

The patent of Mercuri et al. is directed to graphite electrodes for fuel cells. In Figures 3, 6, and 7, the reference teaches channels (5) on the surface of the electrode facing the electrolyte that are in fluid communication with linear acicular pores (20).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated by the disclosure of Mercuri et al. to incorporate fluid removal channels on the side of the substrate of DE '756 opposite the side already containing the channels 6. It should first be noted that upon incorporating the substrate of DE '756 into the fuel cell of the French reference, the artisan would be motivated to use the top surface (2) of the substrate as the surface facing the electrolyte since it has more contact area. Accordingly, in this configuration, the channels 6 on the substrate would be located on the outside of the electrode. As noted above, Mercuri et al. teach fluid removal passages (5) in the inside surfaces of electrodes. In column 7, line 9, Mercuri et al. teach that "in the event of a blockage in a channel 20, such as indicated at 7 in FIGS. 6 and 7,

fluid from adjacent channels can flow through grooves 5 so that gas-catalyst contact adjacent the blocked channel is maintained.” Accordingly, this would provide sufficient motivation to incorporate channels onto the inside surface of the electrodes of the French reference, corresponding to the top surface of the substrates of DE ‘756.

8. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over FR 2667728 in view of DE 198 20 756 in view of Wilkinson et al. in view of Mercuri et al. as applied to claims 1-6, 8-13, and 15 above, and further in view of Okamoto (U.S. Patent 5,723,228).

None of the applied references expressly teaches a fuel cell stack comprising a first end cap assembly having a first fluid inlet port and a second fluid outlet port, and a second end cap assembly having a third fluid inlet port and a fourth fluid outlet port.

The patent of Okamoto et al. is directed to a fuel cell stack having end plates (22a,b; see Fig. 3). As shown in Fig. 3, end plate 22a has a first inlet for fuel (i.e., methanol and water) and a second outlet for fuel, and end plate 22b has a third inlet for air and a fourth outlet for air.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the fuel cell stack and end plate structure of Okamoto et al. in constructing the fuel cell stacks containing the claimed electrode assemblies. In column 2, line 7, Okamoto et al. teach that “[a]ccordingly, the aqueous methanol solution as fuel flows through a fuel cell unit in the direction opposite to the direction in which the oxygen containing gas flows. Therefore, it is possible to minimize the

ununiform temperature distribution in the fuel cell unit as less as possible. Thus, it is possible to obtain a stable output voltage from the fuel cell unit.” Accordingly, the artisan would be motivated to use the fuel cell stack and end plate structure of Okamoto et al. in constructing the fuel cell stacks containing the claimed electrode assemblies.

Double Patenting

9. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

10. Claims 17-40 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-8, 14-16, 18, 19, 21-24, 29-62, and 65 of copending Application No. 09/715,830. Although the conflicting claims are not identical, they are not patentably distinct from each other because the claims of the '830 application anticipate the instant claims. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993).

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Allowable Subject Matter

11. Claims 7 and 14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

12. Claims 26 and 33 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims and if the above-noted obviousness-type double patenting rejection was overcome.

13. The following is an examiner's statement of reasons for allowance:

Claims 7 and 14 recite that the electrode comprises a "sol-gel" in combination with fluid delivery and removal channels. The term "sol-gel" is interpreted herein as a "metal oxo macromolecular network," as defined in the specification on page 22, line 27. While DE 19820756 and Mercuri et al. in U.S. Patents 6,413,671 and 6,528,199 teach fluid delivery and/or removal channels in combination with transverse acicular pores, none of these references teaches or fairly suggests a metal oxo macromolecular network in combination therewith. Accordingly, claims 7 and 14 contain allowable subject matter.

Claims 26 and 33 recite that the anodic and cathodic porous regions each comprise a plurality of interconnected mesoporous acicular pores. The art of record, particularly DE

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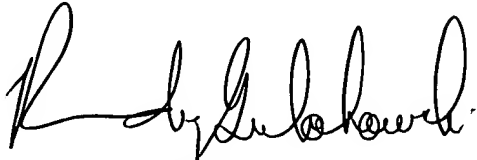
19820756, does not fairly teach or suggest these limitations. DE '756, while teaching acicular pores, does not fairly suggest that these pores are "interconnected" (herein, "interconnected" is interpreted as being connected *within* the substrate, not on the surface thereof). Accordingly, claims 26 and 33 contain allowable subject matter.

Conclusion

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Crepeau whose telephone number is (703) 305-0051. The examiner can normally be reached Monday-Friday from 9:30 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski, can be reached at (703) 308-4333. The phone number for the organization where this application or proceeding is assigned is (703) 305-5900. Additionally, documents may be faxed to (703) 305-5408 or (703) 305-5433.

Any inquiry of general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.


RANDY GULAKOWSKI
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

JSC

March 31, 2003